Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Aug 2017

Project Reference Number

NIA_NGN_212

Project Registration

Project Title

Squeeze free flow stopping on PE mains

Project Reference Number

NIA_NGN_212

Project Licensee(s)

Northern Gas Networks

Project Start

September 2017

Project Duration

3 years and 7 months

Nominated Project Contact(s)

Mick Smith MickSmith@northerngas.co.uk

Project Budget

£241,866.00

Summary

Radius PLUS has commenced a development project of its own to develop live access electrofusion access saddles for deployment of stopper systems to PE mains, specifically the smaller diameter type needed for its RTP stopper deployment. Such systems will be available for mains 63mm to 450mm when fully completed, including imperial 3” to 8” sizes. It is proposed that the NIA project run concurrently with that development to accelerate the development through offline deployment testing, review and definition of engineering standards for medium pressure RTP stoppers, preparation of codes of practice/engineering policy documents that all lead to ability to undertaken field trial deployment safely within the network. Three field trial deployments have been included within the scope of the RSL cost elements, the value can clearly be adjusted if further field trial deployments were preferred for the purpose of statistical or practical confidence of the technique in the network.

Third Party Collaborators

Radius+

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

With the exception of a few proximity related applications, polyethylene pipes have become the preferred material for the construction of new gas distribution pipelines at pressures to 7bar. Over the past twenty years this has been accompanied in particular by the growth in diameter of pipes laid, with pipes to 630mm in routine use and pipes to 800mm now being laid in the UK for the first time. The principles of installing these pipes though often involves the simple scaling of ideas used on small diameter pipes to the larger sizes and this is not always an optimal approach. One area where scaling introduces a challenge is the use of the squeeze off flowstopping technique and problems are well documented. The problems are commercial in terms of cost, practicality in terms of disruption due to the use of the technique and safety related where there is a failure (and there have been high profile

failures that attract HSE oversight of this work practice).

From a commercial perspective, the employment of the technique on say a 400mm diameter PE main, where the main is laid in a road structure, can attract excavation and reinstatement costs in the region of £60-70k per squeeze off operation. This is due to the significant length of excavation required to achieve minimum separation distances between tools and in particular away from butt fusion and electrofusion joints which may be present in the pipeline. These are significant costs to bear in the network.

The example given highlights the practical element also. The excavation length required for example to isolate a main so that a repair, alteration or diversion can be performed is of the order of 15 metres assuming the theoretical minimum separation distances are used, something that does not happen in practice as the original butt or electrofusion joints used along with 6m or 12m sticks always increases length to achieve minimum separation distances. Combined with the width required for the works (at least 2x the diameter of the pipe to permit it to squeeze flat plus tooling space) these are substantial excavation works to be subject of traffic management.

The third and most problematic aspect relates to the safety of operations when using this technique. This was evidenced with an incident at Rawtenstall in December 2008 where a butt fusion joint ruptured on a large gas main during a squeeze off incident resulting in a large scale incident. HSE and gas networks are rightly concerned about the suitability of the technique and several have given undertakings to the HSE to remove the technique from their operations and replace it with one that combines cost reduction whilst at the same time reduces risk arising from network operations.

To date this has been achieved for low pressure mains operating below 350 millbar by the universal introduction of inflatable stopper technologies. Inflatable stoppers have been used successfully at all diameters to 630mm for over 5 years and permit much reduced excavation works and a safe system of work. The use of inflatable stoppers is preferred over mechanical plugging machines as they first of all provide automatic compensation for the pipe geometry, specifically SDR which can vary given the age profile and design approaches taken over nearly 50 years of installations, and also because the equipment is lightweight and within the capability of polyethylene pipes to support it during deployment – not the case with plugging technology which is geometry specific and needs related civil engineering works. The current solutions though do not provide the basis for deployment on polyethylene pipes operating at medium pressure (2 bar) or intermediate pressure (7 bar) pipe systems.

Method(s)

In 2016, Radius PLUS Limited and Wales & West Utilities completed a project outside of the NIA/NIC process to introduce a technology using RTP inflatable stopper systems to flow stop medium pressure metallic mains in the size range 3” to 16” nominal bore. This allowed a new style of stopper system to be evaluated that has the capability to withstand higher differential pressures than the traditional bladder/bag stoppers used in the UK gas industry. A series of installation works through 2016 has validated the use of the technology with an operational network environment additional to the offline validation. The technology offers a basis for extension to polyethylene mains which would provide a universal solution for deployment across the network.

Scope

Radius PLUS has commenced a development project of its own to develop live access electrofusion access saddles for deployment of stopper systems to PE mains, specifically the smaller diameter type needed for its RTP stopper deployment. Such systems will be available for mains 63mm to 450mm when fully completed, including imperial 3” to 8” sizes. It is proposed that the NIA project run concurrently with that development to accelerate the development through offline deployment testing, review and definition of engineering standards for medium pressure RTP stoppers, preparation of codes of practice/engineering policy documents that all lead to ability to undertaken field trial deployment safely within the network. Three field trial deployments have been included within the scope of the RSL cost elements, the value can clearly be adjusted if further field trial deployments were preferred for the purpose of statistical or practical confidence of the technique in the network.

Reason for extending the project

The project has experienced significant timeline delays. These have been due to impact of Covid 19 situation; restricting work in our operational areas and prioritising essential only jobs for the safety of our customers and colleagues.
It is envisaged with the easing of restrictions that this work can be picked up again but the overall lifecycle of the project has been impacted. Please see the 2020 progress report for further details.

Objective(s)

1. Conduct failure mode and effects analysis (FMEA) for the holistic system of flowstopping PE mains using the technique. Identify system issues to be resolved in design and testing to de-risk technique.

2. Conduct FMEA on access saddles with a gap analysis to GIS/PL2-4 and GIS/PL3 for long term integrity of saddles post flowstopping, document design/test requirements to a suitable addendum
3. Conduct testing of saddles in accordance with revisions proposed to the GIS/PL2-4 and GIS/PL3 standards to provide specific third party peer reviewed engineering reports on suitability of products
4. Conduct FMEA on RTP style inflatable stoppers with a gap analysis to GIS/E19 and GIS/E20 and commit to a new draft GIS/E20;part 2 document on tests to be applied to the stopper elements
5. Validate test methods proposed for GIS/19 and GIS/E20 in respect of both stopper and deployment to PE (particularly concepts of size range rating and friction slippage factors) by simulation/practical test
6. Undertake off-line trials on representative sizes of PE mains to validate the technique over the size range 90-630mm (proposed 90, 180, 315, 500 & 630mm, 4" & 8") including lifetime testing of assets
7. Prepare method statements, supporting evidence and risk assessments suited to the development of engineering policy in relation to the proposed method of flow stopping for MP mains
8. Subject to sign-off, conduct field trial evaluation on the operational network on a selection of pipe sizes sufficient to confirm confidence in the use of the technique (e.g. small/medium/large pipe size)
9. Prepare final project report for disclosure of overall findings in relation to enabling standards and underpinning data for engineering policy to assist in national adoption (excludes proprietary designs)

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The successful operational deployment of unsupported bag flow stopping systems on medium pressure gas distribution mains 90mm to 450mm PE (with future scope to go down to 63mm) enabling withdrawal of policy approval for use of squeeze off techniques in this size range specifically relating to medium pressure PE mains.

Project Partners and External Funding

This project is completely funded under the NIA.

Radius plus

Potential for New Learning

Development of a standard embodying design & failure mode considerations for RTP stoppers

Development of evidence to support the removal of lifetime limitations associated with inflatable stoppers

Development of evidence to support the cleaning rather than disposal of stoppers contaminated with MEG

Development of a standard embodying design & failure mode considerations for MP bagging access saddles

Scale of Project

This project will require field trials to evaluate the proposed technique. Approval of the new technique cannot be provided if this does not take place.

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The development and testing will be carried out in NGN's network and Radius plus premises.

Revenue Allowed for the RIIO Settlement

n/a

Indicative Total NIA Project Expenditure

External costs – £181,400

Internal costs - £60,466

Total project costs – £241,866

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

We estimate that this could save £680,180 per annum

Please provide a calculation of the expected benefits the Solution

The above saving is based on a predictive usage of the developed technique of 100 times per annum. The new technique will save approximately 9 hours per operation and a reduction in size of 9m3 per excavation.

This equates to:

- reduction of brought in service costs of £500k per annum
- a reduction of reinstatement costs of £144k per annum
- improved efficiency costs of £36k per annum

Total estimated savings of £680,180 per annum.

Please provide an estimate of how replicable the Method is across GB

This new method could be replicated by all GDN's. The savings will vary dependent on the usage of the applied technique.

Please provide an outline of the costs of rolling out the Method across GB.

This service will be available for all GDN's to utilse. The new method will cost £5k per operation.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☑ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☑ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

All GDN's could benefit from the approval of this technique, eliminating the need for Squeeze off on PE mains.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

The ability to withdraw the use of squeeze off techniques associated with medium pressure mains to satisfy HSE Regulator commitments & reduce operational costs. A technique that through publication of industry standards can be introduced across the GDN businesses.

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

Cadent have previously undertaken a small project using mechanical stoppers for medium pressure mains but this has a limited size range capability to a small number of PE pipe sizes and is only approved for limited deployment. No mechanism is available to realize the benefit outside of the GDN or across the whole product portfolio.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

The RTP Inflatable flow stop method has been approved for use on steel mains but requires further development for use on PE pipe systems. Currently the 'squeeze off' method is used which is fit for purpose however requires large areas of ground to be excavated. This has led to safety incidents such as highlighted above. The development of this technique has not been tried before as networks have not been willing to invest any of their own capital developing a technique and testing against necessary standards, which is

unproven on PE pipes whilst an alternate solution exists already, irrespective of being aware of potential benefits that investment may bring.

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

As above

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

The project must be funded under NIA due to the challenges faced commercially. At present, the only option for undertaking this task from an operational perspective is via the use of a bought in service. The project will deliver an alternate option, this also will be via a bought in service, albeit at a reduced rate through a reduced time taken to undertake the task. The new service will be one that can be undertaken with reduced time, excavation and associated reinstatement which presents safety and environmental risks, However from a technical perspective a significant investment is required to achieve technical approval, networks would be reluctant to fund and explore this proposal due to the costs associated and the immediate availability of a solution, albeit one that does not provide the same forecasted safety, environmental and efficiency benefits.

This project has been approved by a senior member of staff

☑ Yes